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AMERICAN VETERINARY REVIEW,

SEPTEMBER, 1878.

ORIGINAL ARTICLES.

THERMOMETRY OF THE DOMESTICATED ANIMALS,

AND ITS USE IN VETERINARY MEDICINE.

BY AUG. ZUNDEL.

Translated from "Vortrage fur Thierarzte." Series I, Heft III., by G. A. Banham, M.R.C.V.S.

The importance to which the exact measurement of the temperature of the body has of late years attained, and the general value of the thermometer in veterinary, as well as in human medicine, has induced me to place before the reader a short sketch of the phenomena in the domestic animals.

If we assume that the application of the thermometer is often over-estimated in the daily practice, as it frequently appears to be, yet we acknowledge on many occasions, the indisputable utility of measuring the temperature, since by this means, we ascertain many occurrences and changes in the organism, which would otherwise have been delayed to a much later period by ordinary symptoms. The thermometer has been the means of ascertaining many scientific results, which led to the explanation and unravelling of many hidden and obscure patho-physiological questions. Heat is a physical agent in all the physiological and pathological phenomena

of life, and is the principal cause of all manifestations of vital power from whatever source they are derived. The domestic animals and birds present a tolerable *constant temperature* in health, *i.e.*, their warmth is not dependent upon the medium in which they live. In disease, however, we find more or less alteration, and as Claude Bernard has proved, a disease may be fundamentally diagnosed by the mere deviations of the temperature from the normal standard. When the natural warmth of the body exceeds a certain degree, death follows from the excessive combustion of the tissues, just the same as would be produced by external (artificial) heat. On the other hand, life is impossible if the temperature of the body is cooled below a certain point. Thus by artificially cooling an animal below 20° cel., the natural temperature cannot be restored, and therefore death ensues.

Claude Bernard has also shown, that if animals are exposed to a high degree of heat, so that their internal temperature rises 4° to 5° above the normal point, they die. Richardson gives us 5.5° to 6.5° as the limit to which the internal temperature of warm blooded animals can be raised without causing death.

It was observed as far back as the time of Hippocrates, that an increase in the temperature of the body was an important sign of acute disease. But it is self-evident that an exact measurement of the warmth of the body could only take place, after the discovery of the thermometer, for the method of ascertaining it by the hand, is very untrustworthy.

The first observations with the thermometer are ascribed to a Venetian physician, named Sanctorius, (died 1638), and its value in disease was promoted by Boerhave, Van Swieten, and more especially by De Haën. In later times it was used by Hunter, Currie, Lavoisier, Dalton, and in the first half of this century by Chossat, Donne, Gavarret, Andral, Traulee, Mayer Helmholtz, De Costa, Baerensprung, and many others.

In the year 1852 Claud Bernard communicated to the Academie des Sciences of France, the influence the division of the sympathetic nerve had on the generation of heat, and many investigations were carried on in this field, and especially in Germany. Wunderlick's work on "The Relation of the Temperature of the

Body in Disease," (1852), created considerable attention. He was the first who maintained that it set down rules and regulations in the course of certain forms of disease, manifested by the rising and falling of the temperature. Soon after this followed the excellent publications of Liebermeister, Thomas, Marey, Hirtz, See, Alvarenga, Woillez, Bulker, and others.

The thermometer was then introduced into veterinary medicine. The first observations were made by Bassi, Schmelz, Schmidt, Adam, Gerlach, Zangger, Leisering, Stockfleth, Rueff, Sanderson, Colin, Trasbot, Zundel, Pfley, Lydten, Bayer, Anacker, Brusasco, Krablee, Flemming, Siedamgrotzky, Dele, and others, whose results I have taken for the foundation of the following.

Before we consider the aim and signs which the thermometer affords us, we must reflect on some important physiological facts, which arise from the development of the specific warmth of the animal body.

The source of animal heat is produced by the chemical changes which take place in the body, due to the reception of oxygen from the external atmosphere entering into combination with the tissues. That portion of the heat which becomes free (or generated in excess) is called sensible (or palpable) heat. The lungs serve as a simple reservoir for the oxygen, and no peculiar warmth is generated *in* the respiratory organs themselves; they undergo just the same slow oxydation as the other tissues of the body, which is effected by means of the circulation of the blood, thus distributing the warmth equally in all parts, the circulation being under the influence of the nervous system. Thus the nervous system may be looked upon as the regulator of the temperature of the body.

When the temperature of the external atmosphere stands at nil 0° centigrade, the cold acts as an irritant to the peripheral nervi-vasorum, causing the superficial blood vessels to contract, and as a consequence, less blood to the surface of the body to be acted upon by the cold air. The diminished quantity of blood to the surface, also causes a decreased evaporation from the skin, therefore, less loss of warmth than usual. The internal temperature of the body remains normal.

If the external temperature is higher than that of the body, it has no influence on the heat of the body. The circulation of the blood is quickened, the vessels are enlarged, the skin contains a larger quantity of blood, thus causing sweating and increased evaporation from the surface; the breathing also becomes accelerated, causing more cool air to enter the lungs, which coming into contact with the capillary circulation of the lungs, abstracts heat from the blood, thereby cooling the body.

The specific temperature of animals varies in different species. Thus, in man it is only 37.5°c., whilst in all the domestic animals it is higher. In the horse we find it about 38.25°c., but it may become as low as 37.6°, and rise to 38.7°c., and yet the animal be in perfect health. In cattle the average is 39°; in sheep 40.25°; swine 40.50°; dog 38.10°; cat 38°; and rabbits 38.25°. These numbers are only to be looked upon as averages, for we may have very striking fluctuation in different animals of the same species. For example: the lowest point which has been observed in a healthy dog is 37.4°, and the highest 40.6°. We may look upon this as explanatory of the discrepancies which we find from the various observers. Whilst Fleming gives tolerable high numbers, we find Gurlt and Siedamgrotzky moderate, and Krablee gives only low, without assigning any special causes.

The above are average degrees, and are taken from numerous observations of veterinary surgeons.

These variations in temperature are often due to the warmth of the thermometer itself, and to the manner and mode of application.

Again, we do not find the same temperature in all parts of the same body. The coldest part being the tegumentum communis, due to its contact with the cold objects, also to radiation and evaporation. Parts which are sheltered by hair, those portions which are in contact with others, such as under the mane, tail, between the limbs, &c., are of a higher temperature, because the air is not so quickly changed in these parts as in those less protected.

Although the blood circulates throughout the whole body, by which means the temperature of one part compensates that of

another, thereby causing a tolerably even temperature in the body yet we find it is not the same in every part. In those organs in which much warmth is generated, we find the blood (venous) flowing *from* such organs to be much warmer than that (arterial) which supplies it, and in those organs in which warmth is expended, the opposite is the case. The blood contained in the heart shows great variations of temperature, sometimes that of the right and sometimes that of the left being warmest. Haller, Krimer, Saissy, J. Davy, Masse, Becquerel and Breschet, found the arterial blood always warmer than the venous; Berger, Collard de Martigny, Hering, Cl. Bernard, observed the opposite to be the case. They held the blood of the left side of the heart to be about 0.2°c. colder than the right. Colin took comparative temperatures of both sides of the heart of horses, cattle, sheep and dogs, and in 93 cases, he found 21 in which both sides were the same, 45 in which the blood of the right side and 27 when that of the left was warmest.

Clinical Thermometry is that which furnishes us with the variations of the animal temperature during disease, and it expresses this in numbers, so that it does not depend upon the practice and acuteness, &c. of the examiner. The thermometer then proves of immense advantage to the practical veterinarian, by aiding him to make a correct diagnosis and prognosis, which he could not obtain by any other means; also under some circumstances it points out the approach of disease, which would not have been discovered until much later by the ordinary symptoms of the disease. It also provides valuable hints in the treatment of disease, which would have been delayed until the causes had produced their physical phenomena.

Schmelz remarks that the thermometer is just as valuable to judge the course, and fix the diagnosis and prognosis of a disease, as auscultation and percussion is in disease of the thorax; and it provides a means of explanation, when other symptoms are liable to lead to error. Wunderlich compares a surgeon who forms an opinion of a case of fever, without the aid of the thermometer, to a blind man seeking his way in a strange locality. The warmth of the body resembles that of the blood, whose con-

dition depends upon the general condition of the body and constitution; thermometry also gives a clue to the healthiness of the animal.

The thermometer, however, cannot be looked upon as a common method of investigation in all cases, where a variation of temperature presents itself; but with this, we can hardly acquiesce, especially with relation to veterinary science. Such assertions are only useful under certain conditions, of which we will speak later. The thermometer was brought into common use, from the great value it proved in many patho-physiological discoveries; but it appears to us, that fever can very often be sufficiently known and judged of by the ordinary means of investigation; and the value of the pulse and knowledge of the temperature with the hand in diagnosis and prognosis of fever, has been denied and contradicted; but we must not go too far in this view, and neglect the most exact means we have for measuring the temperature, viz: "the thermometer."

This instrument is necessary where exactness is required, and it answers the same purpose in investigating the temperature, as the second hand does in ascertaining the number of the pulse.

For the correct measurement of the temperature we make use of the common thermometer, constructed of a graduated glass tube filled with mercury, which for medical purposes is generally placed within a second glass tube. Its graduated scale ranges from 35 to 45° celcius, or sometimes from 30 to 50°; each degree is divided into fifths, or better still, into tenths. The bulb containing the mercury should be made of thin glass, so that it can be easily acted upon by the warmth of the body, the bore of the tube being fine. There is a modified thermometer called the *Maximum Thermometer*, which is constructed by allowing a small quantity of air to enter, and divide about a half-inch of the mercury from the superior part of the main column, but this has not all the advantages which were credited to it. In using a maximum thermometer, the uppermost end of the small divided portion of quicksilver shows the degree of heat attained, and when the thermometer is brought into a cooler medium, the main column falls, but the small divided portion remains fixed, thus giving us the opportunity of reading it at our leisure.

To ascertain the degree of heat still more exactly in two different parts of the external integument, also in the deep tissues of the body, the thermo-electrical apparatus is made use of; but as this, as well as the thermograph, are only used for continuous observations, we shall not notice them in this paper.

The temperature of our domesticated animals is generally obtained by placing the thermometer six or eight inches in the rectum, and in complete contact with its walls; it should be left in this situation for about ten minutes, after which it may be read by partially removing it, and then replaced for another two minutes and again read; and if the mercury has remained stationery, we may receive it as the correct temperature. In order to attain the limit as quick as possible, the thermometer should be brought to the normal temperature of the body, by rubbing the bulb with a cloth, or by placing it in warm water, or carefully holding it over a light, before its introduction into the rectum. A false result may be obtained by the rectum being filled with excrement. Again, according to Billroth, the introduction of the instrument itself may cause the intestine to contract and thus produce a change of temperature.

The vagina has been recommended as a convenient place for the introduction of the thermometer in the female, but as this is about 0.2° to 0.5° and (according to Gerlach) even a whole degree colder than the rectum, from the fact that the cold air can more readily pass into this cavity than into the rectum; on the other hand, there are times when the temperature of the vagina is about 0.1° to 0.3° above that of the rectum (Brusaseo, Rueff, Anacker), such as during the last days of pregnancy, due to the presence of the fœtus; also for some time after birth, and also at the time of sexual desire, which is called "heat."

On account of the variations of the temperature in different situations of the body, it is advisable that we should adopt one recognized place in order to obtain unison in the results. For this reason *all practitioners should apply the thermometer in the same situation of the body, the rectum being almost generally adopted for the domesticated animals*, the same as the arm-pit is used by observers in human medicine.

It should always be borne in mind, that the thermometer must be properly cleaned and disinfected after being used on animals suffering from a contagious disease, such as rinderpest, anthrax, glanders, variola, etc., in order to prevent the possibility of inoculation, which has been known to occur from this cause.

With regard to the *time* and *frequency* of its use, it is important that the same time and manner should be followed each day, and that the temperature should be taken twice (or even more frequently) during the day, also at those times which are supposed to be the lowest and highest limits of the normal temperature of the body; for instance: if the temperature is taken twice a day, the same time morning and evening should be chosen each day, and if there is any exceedingly remarkable differences at either observation, it should be repeated to confirm the correctness of the same.

The result of each examination should be noted, this being best accomplished by special tables, on which a simple line is drawn from point to point at each examination, thus giving a sketch of the variations of temperature from day to day during the course of a disease. Many clinicers note down at the same time the curve of the pulse and respiration on the same table, also the number of the pulse and respiration. In this way he has a concise table of the relations of the temperature to the pulse and respiration.

Before we pass on to study the changes of temperature in disease, we must notice a few circumstances which influence the temperature, and therefore require our attention.

The Age.—The temperature of young animals is often about 0.5° higher than that of those which are fully developed. During fever, however, the relation remains the same, except thatt he deviations from normality are quicker. Richardson attributed this increase of the normal heat of young animals to their adipose tissues being more developed, fat being a bad conductor of heat.

In *old animals* the temperature is often 0.5° or even 1° lower than the normal (Siedamgrotzky).

The temperature is normally higher in animals which are well fed than by others; because they are covered by a certain amount of fat which prevents the loss of heat.

(TO BE CONTINUED.)

Name ....

Sex .... *Color* .... *Age* .... *Disease* ....

Admitted .... *Discharged* .... *Result* ....

DATE.	PULSE.	RESPIR-ATION.	DATE OF DISEASE	STABLE TEMPE-RATURE	TEMPERATURE.											
					97	98	99	100	101	102	103	104	105	106	107	
																Morning. Evening.
																Morning. Evening.
																Morning. Evening.
																Morning. Evening.
																Morning. Evening.
																Morning. Evening.
																Morning. Evening.
																Morning. Evening.
																Morning. Evening.
																Morning. Evening.
					97	98	99	100	101	102	103	104	105	106	107	
					TEMPERATURE.											

A CONTRIBUTION

TO THE PATHOLOGY AND ÆTIOLOGY OF HUMAN AND ANIMAL VARIOLÆ.

TRANSLATED BY F. S. BILLINGS.

(*Continued from page* 201.)

From the history of retro-vaccination we deduce, that the lympth of retro-vaccine is of equal value with that of true vaccina, and as we have, per exclusion, come to the conclusion that the origin of bovine variola is either to be sought in variola humana vera, or more generally in humanised vaccine, we will now turn ourselves to the proof of our conclusion. By the consideration of the so-called "original, genuine" bovine variola, four things become apparent, aside from the sporadic character of the same:

1. *Variola vaccina is almost exclusively limited to milch cows.*
2. *Variola vaccina has its seat exclusively upon the udder of the same.*
3. *Variola vaccina comes to observation principally in Spring and the early months of Summer.*
4. *The development of the variola upon the udder does not take place concomitantly, but as a rule irregularly.*

This idiosynic character of variola vaccina offers a striking variation from that of all other infectious diseases. Authors have sought to explain it in various ways. We have already referred to this subject, and have found, among others, that it has been supposed that cattle possessed in Spring a peculiar inclination to cutical exanthemata, and further that changes of food, and the thereby functional congestion to the lacteal glands. was supposed to exert an unfavorable influence; and that it has been assumed that milk cows only possessed a disposition to this disease. By all who assumed the epigentic origin of the disease it remained an unsolved enigma why male, or castrated animals, calves and heifers were not so frequently attacked by the disease as the milk-cows,

and why by milk-cows other delicate parts of the cutis were not complicated as well as the udder. I have previously mentioned that in those seldom cases where non-milking calves, or young animals and bulls were complicated by the disease, that in almost all cases it was possible to prove that the animals in question had been a short time previously infected by diseased milk-cows. As we have already concluded that an infectious disease like this, which appears so seldom, and then only sporadic in single cases, or as an enzootic as limited to stables or droves, must necessarily descend from other forms of variola; as we have excluded all other genetic points except variola humana vera, or humanised vaccine, from our consideration and have shown that although variola vaccina may indeed exceptionally descend from variola humana vera, there now remains only humanised vaccine from which to derive the origin of the original or genuine bovine variola. Having narrowed our conclusion down to this one point, it is not difficult to comprehend why variola vaccina does not assume an epizootic character; why its processes are limited almost exclusively to the mammæ of the cow; why it appears mostly during lactation and in Spring and early Summer; and why the eruption appears in such an irregular manner; why the so-called original bovine variola appears mostly during Spring and early Summer—at the legal time of vaccination; why it appears only upon the udder of milk cows, and then only during the lactation period; and why the development of the variola from self-infection is generally irregular, all find a simple explanation in that the vaccine contagium of the human protective variola is accidentally conveyed to the udder of the cow by manipulation of milking by the hands of milkers which have previously been in relation with the inocul ted pustule of children.

Therefore genuine bovine variola—v. vaccina—generates, or owes its origin, at present in those countries where vaccination and re-vaccination of man is practised, to the human proctive inoculation of variola.

The following may serve to substantiate the above:

1. Osiander describes a case of accidental infection of a cow by a boy who had been vaccinated but a short time previously.

2. Koch (Prussian Veterinary Reports with Reference to Contagious Diseases, 1870–'71) reports that the vaccination of the people of a farm occasioned the infection of the cows of the same and eruption of v. vaccina.
3. In the same Report, for the years 1871–'72, is reported an outbreak of v. vaccina among a lot of cows. The first eruption was perceived three or four weeks after re-vaccination of three milkmaids. The disease extended gradually, so that in fourteen days of twenty-six cows only three remained immune from the disease. Most of the cows had only isolated variolæ upon the teats, on others, however, numerous variolæ were apparent upon both teats and udder.
4. In the above Report for years 1874–'75, Damman reports an outbreak of v. vaccina in the Kries Rugen among single herds, at the same time that the inoculated variolæ were in full bloom among the children of the district.
5. In the Spring of 1876, Schneider communicated to me, that at the time the inoculation of the children began, he observed genuine bovine variola by four cows in two stables, which became transmitted to two milkmaids, and from one of the same in all probability to her children.

To these communications, which put beyond doubt the origin of v. vaccine from the protective variola of man—menschlichen schutzpocken—I add a communication from Reiter, the trustworthiness of which is beyond all doubt. Reiter saw in stables, the cows of which he had inoculated with humanized vaccine, that the true bovine variola frequently came to eruption by several non-inoculated cows, and was characterized by the same course and phenomena as that which came to pass in unknown ways—that is, the so-called "original" bovine variola.

The following experiment of Roloff shows that the transmission of the contagium of vaccine to the udder of the cows takes place without any difficulty by means of the hand of the milker, which is the general vehicle:

When a plate of glass, upon which was a very insignificant quantity of lymph from the inoculated variola of a man in a dried condition, was rubbed gently across the slightly eroded

surface of the scrotum of an ox, it led to the development of a variola on the place in question. Ceely reports cases which fully demonstrate the facility with which variolic contagium attaches itself to a delicate cutis: Ceely frequently applies vaccine to the cutis of children and young persons without having recourse to puncture and obtained positive results in that he applied the lymph directly to the cutis, and covered the same with a thin layer of blood, which soon dried and protected it from the action of the air.

In opposition to my assumptions it may be asked, Why the hand of the milker is not first infected with the vaccine? I can only answer, that in this direction the long-continued and frequently-repeated manipulations of milking fail as assistant causes; and on the other side the cases are not infrequent, where an infection of the hand or arm of the milkers is infected from the udder of the diseased milk-cow. Again, cases of accidental transference of humanized vaccine from man to man are now and again reported. Sacco reports of a 19-year-old servant-girl who attended two vaccinated children, and who had frequently to change the bandages of the suppurating pustules, that a pustule appeared on the eighth day upon the little finger, which took a regular course, and generated vaccine pustules on being inoculated to others. As the vaccine of the cow may be transmitted to milkers, so may the accidental transmission of humanized vaccine from man to man take place.

As a final reason, that the so-called genuine bovine variola comes to pass only by means of foreign infection, I must call attention to the fact, that the local eruption upon the udder almost always takes place gradually, from time to time, not coevially. In my opinion, this fact finds only one satisfactory explanation, viz: that from one or more variolæ due to primary infection, secondary variolæ are again developed by means of self-infection, which is very easy in consequence of the intimate relations which frequently take place between the stable floor or the bedding, or by means of the manipulations of milking. On the contrary, we see by human and ovine variola, where the organism is infected by the volatile contagium by the way of

inner infection, a tolerably coevial eruption of the exanthema. By vaccination of man we observe—as a whole, seldom, however—occasionally an uneven development of the vaccine pustule, as well as the eruption of secondary pustules, by which perhaps like factors come into play as by variola vaccina. Again, if a generally acting cause constituted the original development of vaccina, all the animals in the stable would be liable to be attacked at about the same time; whereas, we know, that the disease very gradually extends over the members of a stable or herd.

Our considerations over the origin of variola vaccina lead us to the following conclusions:

There is no such thing as a so-called genuine, original "bovine variola," variola vaccina. Variola vaccina always owes its genesis to external infection, and indeed either from variola humana vera, or, which is at present the most frequent, by interposition of the hands of milkers, from humanized vaccine, which is distributed on all sides; according to its origin, the latter is always a variola vaccine. The vaccinated or re-vaccinated human being is, therefore, not so harmless a creature as is generally assumed; he is in condition to cause the development of variola vaccina. When the process is once present by a cow, it extends itself from the same by mediate infection to others of the same stable or herd, and often enough back to the milkers.

According to all which has been said, we must say we hold the careful search for original bovine variola as unnecessary and unjustified, as we can immediately produce it by inoculation of cattle with humanized vaccine—retro-vaccination—the product being throughout identical and homologous with the so-called "original," "genuine" bovine variola.

The question, Which is the better and most active for the protective inoculation of man—the employment of the humanized lymph or the original vaccine? seems to be solved by our previous considerations, as both appear of equal value, both having originally sprung from variola vaccine. I would formulate the question as follows: Which is preferable for the purpose of human vaccination, humanized vaccine which has been passed through numerous generations of man, or animal vaccine which

has been passed through a succession of animal generations—retro-vaccine—or the primary variola vaccine—vaccinated variola—won by the inoculation of variola from man to cattle? The so-called animal vaccine—cultivated vaccine—is in my opinion nothing more than retro-vaccine originally derived from humanized vaccine, which derives its present cognomen of "animal" on account of its being passed through several generations of calves, and forms a sort of "potentized retro vaccine." In proof of the same, I will say, that inoculations of human beings with such long cultivated animal vaccine give in general the same favorable results, as inoculation with retro-vaccine which has been directly won from humanized lymph. We have yet to make a few remarks over certain *properties* of the *contagium of variola vaccina*, which have a general pathological interest.

As is known, the contagious elements of vaccine are always of a fixed nature. If our views are correct over the origin of variola vaccina, vaccine offers an example of a metamorphosis taking place in the bovine organisms by means of which the original volatile contagium of variola is transformed into the fixed vaccine. If we assume, which at the present day is scarcely doubted, that the ætiological and to all intents identical contagium of both human and bovine variola is of a corpuscular nature, it is in all cases difficult to understand why the same contagium is at one time in condition to penetrate the human organism by means of the atmosphere, and why it is only dangerous to the bovine organism in a fixed condition; especially is this the case when we remember that vaccine is easily conserved in a dessicated form and possesses an important degree of tenacity, which it soon loses in a fluid form. Fluid vaccine lymph generally loses its activity in from five to eight days; it is not definitely known whether it is in consequence of peculiar processes of decomposition, or from physical conditions—coagulation of the lymph. Basing ourselves upon numerous experiments which we shall presently consider, we may assume that vaccine contagium is only in condition to produce its specific pustule and to reproduce itself when it comes in contact with a wounded part of the corium, while, according to experience, it remains inactive from the lungs,

the blood, or the sub-cutaneous areola tissue; otherwise every vaccinated man and vaccine diseased cow would be a centre for many infections. This declaration entirely corresponds to the results of the interesting experiments of Frolich, Senfft, and Chauveau. Frölich always retained positive results after vaccine inoculation of cows by punctures; but he could produce no variolæ eruption when he introduced the vaccine by sub-cutaneous injections, or by injections into the jugularis; but by the last experiments also the disposition to infection from vaccina was removed, as later inoculation gave negative results. Senfft received like results in that he received negative results from injecting vaccine lymph, pure or diluted, into the mammary vein or lymphatics of a calf; the same results followed like injections with the lymph from variola humana. Chauveau never saw a local or general eruption by cattle follow the injection of vaccine lymph into the veins; but although a negative reaction followed, the animals proved resistant to every successive vaccination. These experimentally proven differences are only, in my opinion, to be explained in one way, and that is that the contagium of vaccine only finds the conditions favorable to its development in the superior strata of the corium, while it probably suffers disturbances in the juices of the subcutis as well as in the blood. *It would be of much interest to know definitely if this important fact, which to my knowledge only posecsses an analogy in the artificial disease (Dorchsenchinz), produced in consequence of the cutaneous inoculation by pleuro-pneumonia contagiosa, repeats itself by subcutaneous or introveinous vaccinated men, and if such apparently resultless inoculations also gives protection against later vaccine infection or against variola humana.*

I can not pass by a very remarkable property of the contagium of variola humana and ovina; and this is, that inoculated, they both produce a far milder and far less lethal disease than when infection takes place in a natural manner. It is not at present to be decided whether this is owing to the manner the contagium gains access to the organism or not.

A very important but little observed property of the contagium of vaccina is that it is active even when extensively diluted;

(according to Rieter 1–1600), presupposing that the wound is large enough to offer a sufficient surface of contact for the dilution. The concentration of the vaccine and the size of the wound stand in opposite relation to each other. Hiller found a dilution in glycerine of 1–10 still active, and Chauveau received positive results with an aqueous dilution of 1–150.

With regard to the activity of the vaccine contagium in the blood of vaccinated persons, Hiller received negative results, but much depends on the manner in which the operation is performed, for we find other trustworthy authorities, such as Reiter, received positive results from inoculation made with blood of children which had been vaccinated eight days previously. The blood of a vaccinated child is also capable of infection when used in sufficient quantity. Zülzer has shown the same to be true for the contagium of human variola, Osiander and Furstenburg for that of ovine variola. Blood therefore offers a medium by which all parts of an organism become infected, whether the infection takes place naturally or from artificial interference, and we can therefore comprehend that the children of women who are complicated by variola during groviditas, may become infected during their intra-uterine existence, although we know that by other infectious diseases—anthrax, syphilis—the contagium circulating in the blood of the mother does not pass the placental septa. According to the period of groviditas in which the organism of the mother is complicated by variola will the child become infected intro-uterine, by which abortus is a frequent phenomena, or be born affected with the disease. This intra-uterine infection with the contagium of variola has been repeatedly confirmed by observation both by human and ovine variola, the young either being born with the disease or having upon them indications of having passed through the disease intra-uteral, and so remaining immune against either natural or artificial infection.

I have paid great attention to question if any which contagio are in condition when embodied in an organism to pass the placenta septa. In confirmation of observations previously made by Brenell and Davaine, I found that anthrax bacteria found an impassable septum in grovid animals affected with the placenta of

acute anthrax, and that it is in this manner that we are able to explain the phenomena, that the blood of the fœtus of such animals is free from these microparasites. Kassowitz has proven the same to be true with regard to the contagium of syphilis. The conditions in the acute exanthemata, variolæ, measles, scarlet fever, are exactly opposed to the above; the contagii of the same have the ability to infect the fœtus of the same.

For numerous very interesting and confirming cases illustrating the above, I must refer the reader to the original translation.

How does the contagium of vaccine deport itself in this relation?

After we know that in the greater number of cases the contagium of variola is in a condition to pass the placental septa, and that the blood of vaccinated organisms contain the contagion of vaccine, we may a priori assume *that the foetus of a successfully inoculated grovid organism becomes as a rule also infected.* When we look for proof for this assumption, we find but one case reported in the literature upon which we can depend, and that is from Underhill, who vaccinated, and successfully, a woman in the eighth month of pregnancy. Six weeks later parturition took place, and in the course of three or four months the child was very carefully inoculated with fresh lymph, but unsuccessfully. According to this example, the young of grovid females can be rendered immune against vaccine by inoculation of the grovid mother.

This intra-uterine infection comes to pass, in my opinion, much more frequently than we think, and the subject is in every way worthy of the most critical and statistical observation. Numerous cases are on record confirming our views in regard to the ovination of sheep, where the young of ovinated grovid ewes have remained immune from infection in every form for a certain period.

Conclusion:—Our considerations have brought us to the result that there are only two well characterised and idiopathic forms of variola, viz.: variola humana vera and variola ovine. By both we are able to prove the (present) origin, the first from variola-diseased men, the second from variola-diseased sheep.

Both forms are frequent; there is a constancy in the continuity of the individuals attacked, and deport themselves as other infectious diseases of man and animals. The variola of man belongs to the true epidemics, that of sheep to the genuine epizootics.

On the other side we have concluded that the remaining forms of variolæ among the domestic animals do not form idiopathic diseases, v. equina, vaccina (bovina), caprina, porcina, and canina, as they descend directly from one or the other of the above named protopathic forms, but may also at present take their origin reciprocally from one another. The most general characteristic for these deuteropathic forms of variola is that they appear unfrequently and never in epizootic form, generally more isolated or as enzootics limited to single stables or herds.

We are at present unable to decide in what relation variola humana and variola ovina stand to each other, if one originally proceeded from the other, or which is the true original variola. Experimental pathology, which we have to thank for so many brilliant results, has here an open and profitable field for further work. At least there is scarcely a doubt, and I here endorse in full the views of Bohn, that the reciprocal transmissability of the different forms of variola as well as the reciprocal substitution, vicarisation—"Stettvertretung"—of the human and animal variolæ indicate that at the foundation we have before us an identical contagium, and that the variolæ have sprung from a common matrix and are related to one another; as an individual inoculated with variolic contagium peculiar to another species is rendered non-susceptible not only against infection from its own peculiar form, but from that of other species, for a variable length of time. The probably originally identical variola contagium exerts a very different influence by the different zoological species, although in its principal effects it retains a certain degree of conformity. In this direction it presents a striking example, that contagii have to a certain degree the ability to conform themselves to the organisms in which they gain access—the manner is of no consequence—and thereby deport themselves consequently to the variations of the natural historical species, which pliable and capable of adaptation, a property which does

not oppose the organic nature of these infectious elements.

We have further shown that the bovine variola, v. vaccina, cannot be considered as a genuine or original form of variola, and that in all probability it takes its origin either in v. humana, or, at present, in humanised vaccine, and finally I have called attention to the fact that under certain conditions the fœtus is accessible to intra-uterine vaccination by timely vaccination of the mother, and that theoretically and practically proven fact is well worthy of further consideration and proof.

[The above hurriedly-made translation of the greater part of this very excellent contribution to pathology will, I hope, be found very interesting to the readers of the REVIEW. I say hurriedly made, for those who know the work the translator has on his hands, must know that everything he at present does is forced; so I beg pardon for any ambiguity of expression, and make myself responsible for all mistakes except those of the unfortunate "chap" who sometimes rules in the printing office.—B.]

ANATOMY OF REGIONS.

Translated from Peuch and Toussaint, Precis de Chirurgie Veterinaire, by A. Liautard, M.D., V.S.

CONTINUED FROM PAGE 207.

MEMBRANA NICTITANS.

The functions of this little apparatus, its position in front of the eye in the cases where this organ is drawn back in the orbit by the muscular contractions, made it to be called the *third eyelid.* Indeed, it fills the part of an eyelid, having, like them, for duty, to protect the essential organ of vision and to remove from it foreign substances which may accidentally come in contact with it; the membrana nictitans is only visible outside, when this last function is to take place, or when an external cause threatens the

occular globe. In the ordinary state, the membrana nictitans is concealed in the great angle of the eye, its anterior border only being visible; but if a permanent contraction of the muscles of the eye draws it back in its orbit, or when this action is stimulated by a foreign body, the membrana nictitans shows itself under the shape of a thin lamella, convex on its external face, concave on the internal, wide at its anterior part and narrow at its posterior, thus assuming the shape of a triangle, whose posterior angle is much elongated. In the motion described above, the third eyelid glides between the two palpebral veli and the globe of the eye, as in two grooves represented by the conjunctival fissures; these give it its directions; without them it would look upwards. Except in the case of permanent contraction of the muscles, as in tetanus, the action of the membrana nictitans is instantaneous, and it soon returns in the nasal angle of the eye.

The angular extremity of the membrana nictitans is united to a large adipous cushion situated between the muscles of the eye; its projection forward then is only an action entirely mechanical. Indeed, in the retraction of the eye in its cavity, there is pressure upon that cushion, which has a tendency to change position, and pushes forward the membrana nictitans, which rests upon it; its action is therefore so much more complete that the contraction of the muscles is greater. In this motion the third eyelid carries with itself the conjunctival fold which surrounds it. It is this same fold with adipous tissue which covers the internal angle of the eye in case of contraction; for its adherent angle would be too narrow to reach this result without the existence of this extra apparatus.

The membrana nictitans may be affected with an ulcerative inflammation which may extend to the cornea.

Differences.—The membrana nictitans is so much more developed that the number of digits is smaller. In its greatest development in solipeds and ruminants, it becomes less voluminous in the pig, smaller still in carnivorous. The third eyelid of birds must not be taken for it.

ORBITAL CAVITY.

In the skeleton this is reduced to an opening situated on the

limit of the anterior and lateral faces of the head, on the line with the separation of the cranium and the face, completed behind by a fibrous apparatus called the *ocular sheath;* this last, which separates the ocular apparatus from the temporal fossa, belongs, also to the orbital cavity.

The anterior opening of the orbits is turned outwards and slightly forward; its form is that of a circle, somewhat depressed sideways, and also a little from above below. Thus it resembles a rectangle, whose sides have been united by wide curves instead of sharp angles. The greatest dimension of the orbital opening extends from the orbital apophysis of the frontal to the zygomatic; it is consequently perpendicular to the palpebral fissure and about one-sixth longer than the transversal diameter The bones which form it are the larymal for the inferior anterior angle, the frontal for the internal and superior side, the zygomatic for the inferior and external. The extremity of the zygomatic process of the temporal, in reaching between the orbital portions of the frontal and the ascending process of the zygomatic, co-operates to the formation of the external sides.

The bony wall of the orbital cavity is complete only on the internal side; outside its form is that of a wide ring, measuring between two and two and a half centimeters. It presents, at the supra-internal angle, the supraciliary foramen, which gives passage to an arteriol and to a division of the ophthalmic branch of Willis; inside and above, a depression lodging the curve formed by the great oblique muscle, when reflecting itself upon the fibrous band which is attached on the border of that depression; at last, in the infero-internal angle, a deep fossa ending by a canal, hollowed through the larymal bone and receiving the larymal sac, and the canal rising from it.

The bony wall of the superior face and the external side, is extended posteriorly by the *ocular sheath.*

This is a fibrous membrane, horn shaped, whose summit is attached to the edges of the orbital hyatus; it is fixed forward upon the bones already named, mingling with their periosteum. It is strong and thick in all the external part which has no bony base to rest on; on the internal side it is thinner and lays against

the frontal. It presents several openings for the passage of blood vessels and nerves; is surrounded by a somewhat thick layer of adipous tissue, which separates it from the surrounding muscles and from the coronoid process of the maxillary, which might pinch it during the motion of the jaws. In its interior are found the globe of the eye with its muscles, the blood vessels and nerves of the eye.

Differences.—In *ruminants*, the anterior opening of the orbital cavity is formed by the frontal, larymal and zygomatic bones. The process of the temporal does not extend as far as the orbit. This opening is notched on the internal side, where the frontal and larymal unite; the supra-inferior diameter is more developed than the transversal; the orbital foramen, more developed, is situated more backwards and inwards; simple at its internal orifice, it divides and opens on the anterior face of the frontal by one, two, or three orifices.

In dog, and generally in carnivora, the orbital process of the frontal does not unite with the zygomatic arch. In its place is a strong ligament upon which the antero superior border of the ocular sheath is attached.

The orbit of the pig is like that of carnivora.

MUSCLES OF THE EYE.

They are situated in very deep position. I am not aware that operations of myotomy, so common in human surgery, were ever performed upon animals, as in case of strabismus, affections which are very rare in large domestic animals. Few cases are recorded. I have seen one in the dog, and Mr. H. Bouly has observed one in the horse.

The muscles of the eye form two layers round the optic nerve; the most external is constituted by the *straight* muscles, divided into superior, inferior, external, and internal, and having common characters. They are little fleshy bands, thin on the borders, by which they are all more or less united. The separated contraction of each of these muscles carries the ocular opening on the side of the muscle in action, either above or below, outward or inward, and even in intermediate positions if they contract two by two.

Inside of this first layer, one finds another, formed like the first of four fasciculi, united by their borders; the mass of

these is called the posterior straight. Its presence is related to that of the membrana nictitans, as it is missing in animals where this organ is absent, especially in monkeys and man; it is principally the contraction of this muscle which draws the globe towards the bottom of the orbit and produces the projections of the membrana nictitans. A thick adipous tissue, united to this organ, rests between these two muscular layers and also between the deep layer and the optic nerve.

Let us also mention the oblique muscles which allow the motions of pivoting of the eye when the head is inclined laterally; the superior oblique, or great oblique, which, from the bottom of the ocular sheath, reflexes itself upon a small tendon attached on the internal side of the orbit, hence to the superior face of the eye. The internal oblique rises from the internal face of the orbit and goes to the superior face of the eye. These muscles are antagonistic of each other when examined on the same eye, and on the contrary antagonistic of that of the same name in the opposite eye, when the parellelism of the axis must be maintained as in the case of lateral inclination of the head.

The elevator of the superior eyelid is also lodged in the ocular sheath, altogether on the internal face above the superior straight.

Numerous blood vessels are distributed to these muscles or run through them so as to reach the globe of the eye.

Amongst them we will mention the ophthalmic artery, an orbital branch, the supraciliary and central arteries of the retina. A large vein, the alveolar, runs through the ocular sheath to empty into the cavernous sinus; it establishes communication between this and the glosse-facial, with which it unites on the anterior border of the masseter near its superior insertion.

Nerves are numerous. We have the nerve of first pair, or the optic, functional nerve of the eye; that of the third pair, common ocular motor, going to the superior, posterior, internal and inferior straight; the pathetic which goes to the external straight. And then the ophthalmic of Willis, which carries excessive sensibility to all the parts of the eye, in connection with the orbital branch of the maxillary nerve.

(To be continued.)

EDITORIAL.

Amongst the progress made for the last few years in the appliances for the diagnosis and prognosis of disease, the application of the thremometer must take a first rank.

Indeed, it is only a few years since, that the use of this instrument by physicians first, and afterwards by veterinarians, was called into extensive and general practice.

American veterinarians were not the last to see the benefits to be derived by the use of this little instrument, and though many old practitioners smiled at the idea of the *new toy*, as some called it, it soon became, in the hands of the conscientious observer, an excellent means of assistance, and it soon was found, that both the practictioner, as well as the student, could scarcely do without their thermometer.

True, its use has been overstretched and often misplaced, specially by young practitioners, who in many instances no doubt, have applied it when there was no need for it, and many young graduates will remember forgetting it in the cavity where it was placed, and when returning to find it in the bedding or amongst fæces broken in many pieces; but with all that the thermometer has established its place in the general practice of medicine, and to-day it is rare to read a report of a case without careful observations of the temperature.

We give our readers in this number of the *Review* the beginning of an article on thermometry, translated from the French by Mr. G. A. Banham, M.R.C.V.S., who is now completing his studies in Germany, and also a copy of the table which is used by many practitioners to record the variations which are to be noticed during a disease. These tables can be printed and bound in book form, and thus careful record be kept. As it is yet a new study, much remains to be done in the history of the application of the thermometer, and every veterinarian may in his own practice help to build up positive data which, every one will

see, will become most essential in the diagnosis, prognosis, and treatment of diseases.

At the request of the Secretary of the United States Veterinary Medical Association, we publish the notice of the annual meeting of the Association, an occasion of which we have no doubt, every member will take advantage and be ready to answer the roll call.

THE GERMS THEORY.

ITS APPLICATION TO MEDICINE AND SURGERY.

By M. M. Pasteur, Chamberland and Joubert.

Translated by A. Liautard, M.D., V.S.

CONTINUED FROM PAGE 222.

The numerous cultivations of the septic vibrio that we had to make, allowed us to verify curious facts concerning the natural history of microscopic organisms.

One of the liquids that we used was the extract known as Liebig's bouillon, diluted in ten times its weight of water and neutralized or rendered slightly alkaline and warmed to a temperature of 115° for fifteen minutes, thus rendering it entirely imputrescible to the contact of pure air.

We have said that the septic vibrio is formed of small moving little threads. This is particularly its appearance when collected in the abdominal serosity or muscles of dead septicemic animals; but it is often associated, specially in muscles and particularly those of the abdomen, with very small, generally immovable bodies having a lenticular form. These carrying sometimes at their extremities a corpuscle germ, remains to us for a long time a puzzle and a mystery. We have learned, however, by our trial in cultivation that they are nothing else than one form of the septic

vibrio. Sometimes the little lenticular body ends on one side with an elongated appendage, assuming the form of the tongue of a bell. We have also seen the septic vibrio with the form of little sticks extremely short, very minute; but what is most surprising, is the facility with which the septic vibrio may reproduce itself without showing the slightest motion, losing then a certain amount of its virulency, but never being entirely harmless. For a long time, we even believed that we had two or more septic vibrios of different forms or virulency, and that by our cultivation we had obtained separations, more or less complete, of each of these different vibrios. It was not so. We have found in *septicæmia proper* only one vibrio, which may change in aspect, in facility of propagation, in virulency among the liquids where it is cultivated.

The best proof that we have had, in our numerously repeated experiments, only one vibrio, is that the last cultivations were brought back to their power of virulency of the beginning by changing the liquids of those cultivation. Let us reproduce ten, twenty, thirty times in succession, the septic vibrio in Liebig's bouillon, and to this let us substitute bloody serum containing few fibrinous clots, the new culture will furnish a powerful septic vibrio, killing at a 1-2000 of a drop, and the blood and serosity of the animal thus killed will possess at once a power of virulency much higher with the forms and methods of the septic vibrio.

From the preceding facts let us remark how premature are, in the present state of our knowledge, the classifications and nomenclatures proposed for beings which may change in aspect and properties, as much as we have shown through external conditions.

In the study of microscopic beings, any method is precious, if by it one may succeed in separating from each other numerous species whose association is so common. The properties of the ferments living without air, placed us a moment ago on the discovery of one of those methods. I mean to say of the cultivation in the vacuum, opposite to the one made in presure of the atmospheric air. How many aerobic germs are mixed with those of an anerobic organization, cultivation in vacuum will allow us to separate them. It will be the same for a mixture of germs

altogether aerobic and anerobic. By applying this method, by associating it with others already known, sometimes taking advantage of good opportunities, as are sometimes met in long researches, we have found that the atmosphere and water, those immense reservoirs where all microscopic remains of what lived are gathered, contain numerous species of aerobics and anerobics. Without entering in the details of our observations, we may say in a general way, that the inoculation of these organisms often bring on fatal disorders, which even seem to constitute diseases as new by the specificity of their actions, as by the nature of the inoculated organisms. For instance, the septicœmia of which we spoke a moment ago, is not the only one. Air and water contains the germs of a vibrio a little bigger in diameter than the septic vibrio, more rigid, less flexuous and with slower motions. We will describe its effects in another communication.

The following experiments show again another method of separation of microscopic germs. In few points it resembles the one already spoken off.

Let us take a piece of meat of stated weight; say the leg of a large mutton, and after singeing it rapidly over its whole surface, let us introduce in the thickness of the tissues the blade of a bistouri also singed; in the opening thus made, drop a few drops of common water and insert over it a little ball of wadding which has been exposed to a current of air from the street; then cover the leg of mutton with a large glass cover. Again renew the same experiment with another leg of mutton also singed, and some drops of water throughly deprived of living germs by being warmed to 119° to 120°.

If one considers that the muscular tissue absorbes oxygen easily in throwing a volume about equal of carbonic acid, one will easily understand that our drops of water may be considered as having been soon protected from atmospheric air, in presence of an element of cultivation, favorable to the development of some germs. Besides, it is easy to fill up the glass globe which covers the leg of mutton with pure carbonic acid gas.

Here is the result: after one or at the utmost two days, with a temperature of 39° to 40° the gigot with the pure water shows no

microscopic organisms in any of its parts; on the contrary, that with common water, even if it had received but one drop of river water, and more so, if of sewer water, contains in each part of its whole and in all points of its periphery, anaerobic vibrios more or less rapid in their motions and in their propagations.

The experiment is more remarkable yet when a drop of culture of vibrio, pure and free from mixture, has been deposited in a central portion of a piece of meat. The septic vibrio, amongst others, penetrates and multiplies with such a great facility, that each microscopic part of the muscles shows it by myriads as well as the germ corpuscles of this vibrio. The meat, in those conditions, is all gangrenous, green on its surface, swollen with gases, and is easily crushed in giving a sanious repulsive pulp. How powerful, though indirect, this demonstration is of the vital resistance, or to use an expression more vague and still clearer, of the influence of life to overcome the consequences—often so disastrous—of surgical wounds! That water, that sponge, that charpie, with which we wash or cover a wound, depose upon it the germs which, we see, have an extreme facility of reproduction in the tissues and would kill many operated, in a very short time, if life would not resist the multiplication of these germs. But alas! how often this vital resistance is powerless, how often the constitution of the patient, his weakness, his moral condition, the bad applications of the dressing, oppose but an insufficient barrier to the invasion of the infinitely small with which its wound has been, unknowingly, covered! If I was a surgeon, impressed as I am by the dangers which would rise from the germs of the microbis thus spread upon all the objects, particularly in the hospitals, I would not only use instruments of perfect cleanliness, but, after having washed my hands most carefully and exposed them to a rapid singeing—which is without inconvenience—I would have all the charpie, all the bandages, and the sponges first exposed to a temperature of 130 to 150 degrees, and would only employ water which had been exposed to a heat of 110 to 120 degrees. All this is practical. In this manner, I would have to fear only the germs in suspension in the air all round the bed of the patient; but observation shows

us daily that the numbers of those is almost insignificant when compared with that of the dust on the surface of the objects and in the common waters, even in the most clear. And, besides, nothing would prevent the use of the antiseptic manipulations, which, united to those that I indicate, could be considerably simplified. A phenic solution, even very weak and consequently without inconvenience by its action upon the hands of the operator or for his respiration, could be advantageously substituted for strong carbolic solution.

This subject is too important for the Academy not to give me a few moments more of attention to allow me to particularize more and to go into more precise details, if possible, upon the dangers of death after amputation, or even after some simple operation, as we know of several deaths having taken place after venesection.

I will speak of a vibrio which has not yet been noticed, and whose properties throw new light upon the subject which occupies us and upon that great rock of surgery—the purulent infections.

When one take as seed for cultivation in the vacuum some drops of common water, it may happen that it contains only one kind of organism, as common water often contains unique germs when taken in very small volume and as seed for a given culture. This is another previous mode of separation of germs, by-the-way; but, to cut short, I will not stop at the proof of these assertions.

If one multiply cultures thus made with different common waters, he often meets the vibrio I am speaking of, and which presents the following characters*: It is a being at the same time ærobic and anærobic; in other words, cultivated to the contact of the air, it absorbs oxygen and returns an equal volume of carbonic acid gas without formation of hydrogen gas. In this condition it is no ferment. Cultivated, on the contrary, in the vacuum or on pressure of carbonic acid gas, pure, it multiplies also, not without giving this time a true fermentation with formation of carbonic acid and hydrogen, as long as life is carried on without air. It is a new confirmation of our prin-

* At present, with the water which feeds my laboratory, fifty times in one hundred, almost, this result is obtained.

ciple:* *fermentation accompanies life without air;* a principle which, I am persuaded, will one day predominate all our knowledge upon the physiology of the cell.

In the first hours of the development of our vibrio, whose rapidity, especially to the contact of the air, is very great, it has the form of small bodies, very short, whirling upon themselves, turning and waddling about, soft, gelatinous and flexuous, which are easily seen. Soon all motions cease, and then they exactly resemble the *bacterium termo;* like it, it is slightly narrowed in its length, though it is essentially different from this bacterium. If you inoculate a few drops of the culture of that organism under the skin of a guinea-pig or of a rabbit, pus will soon form and be detected after a few hours. The following days an abscess is formed, and in this a great quantity of pus is found. This, it may be said, has nothing surprising, as we know that, in the state of our knowledge, any solid object, fragments of coal, of wool, all give rise to suppuration.

I will add even that these last experiments have been made by us, with materials first warmed and free from microscopic germs; but the activity of our microbe, considered as a generator of pus, should he even enjoy this power only as a solid substance, is noticably increased by the fact of its possible multiplication in the body of animals.

To satisfy us, the following experiment will suffice: A culture of this organism is divided in two halves—one is warmed to 100 or 110 degrees; the microbe is killed, without alteration to its form or size; these equal portions of the two liquids are inoculated into two animals alike. It is easy to observe that the inoculation of the liquid which has not been warmed up gives rise to a greater quantity of pus than the other which produces it as an inert body would. Let us suppose that if the pus obtained from these two animals are separately cultivated; that the one which comes from the animal which has been inoculated with warmed organisms, remains perfectly sterile, while the other, which has received the non-warmed organisms, reproduces this easily and abundantly.

At any rate, here is a new microscopic organism which may

live in the body of animals. We knew the carbuncular bacteridie and the septic vibrio, agents of contagion, of disease and death, not because they give rise to chemical poisons, but because animal economy can be their center of cultivation. We have now a third kind, also able to multiply itself in the living body, and to give rise to a pathological state different, we have seen, from the morbid manifestations which follow the inoculations of the carbuncular bacteridie or the septic vibrio. It is proof that the pus formed by the organism is related to the specificness of its structure. The quantity of pus, for instance, produced by the bacteridie and the septic vibrio, all the points of inoculation or any where else, is so little that it is often overlooked.

Does our new microbe when inoculated, remain confined under the skin at the point of inoculation ?

Can it like the bacteridie or the septic vibrio, spread itself in the whole body when once under the skin ? Experiments answer affirmatively. This microbe can propagate into muscle, penetrate into the blood, in the lungs, in the liver, and give rise in these organs to the formation of purulent collections, metastatic abscesses, in one word to purulent infections and death. This invasion of the whole body is, however, more difficult than by the carbuncular bacteridie or by the septic vibrio. While inoculation of the smallest quantities of these last organisms will bring on, so to speak, sure death ; that of our microbe in equivalent proportions, will only produce abcesses which get well, either because they ulcerate of themselves or because the pus is absorbed, and the microbe disappears, defeated by what I called a moment ago, the life, the vital resistance, the *natura medicatrix*. However, if one increases by the number of the inoculations the number of the abscesseses, it frequently happens that the cure of those cannot take place, and it is then that the microbe penetrates every where, and that the muscles and the liver are impregnated with them.

We have said that the new organism, first warmed up to a temperature of 100 to 110 degrees, and entirely deprived of life, though keeping its form and size, gives rise, when inoculated under the skin and like other inert solid bodies, to abscesses formed by an ordorless, pure pus which is free from microscopic

living organisms. This mode of inoculation has not allowed us yet to produce abscess in the viscera. But, as well as in injecting directly in the blood inert bodies, one may stimulate the formation of metastatic abscesses, as well is it easy to obtain similar abscesses either by the living or dead microbe, by injecting them into the jugular vein.

In this case the lungs, and principally the liver are filled in twenty-four hours with large numbers of metastatic abscesses in all stages of developement, from the simple inflammatory spot to the smallest white pustule filled with pus; but in the point of view of cure, that is the disparition of the abscesses, the facts are different in the two modes of inoculation. Often the animal inoculated with the living microbe, dies rapidly, and any portion of the liver and lungs sown in an inert liquid, will reproduce the microbe. If the sequelæ of the inoculation is not fatal, the disappearance of the abscesses and of the microbe in the viscera is slower than in the case of the animal inoculated with the dead microbe

But we must from the preceding experiments remember that the pus, loaded with microscopic living beings, whose life may go on in the animal economy, brings on greater disorders and more difficult resorption than what we understand generally by pure pus.

We have given in the proof of a prevalent infection localized in viscera, and produced by foreign bodies or by pus entirely free from living organisms, a queer coincidence. A foreign body brings on suppuration; the globules of pus have the same power. Metaphorically speaking we may say: pus engenders pus.

If I had time, I would go on and describe the resorption of metastatic abscesses. It is a phenomena curious to follow in its details, and in which, what is most interesting to observe, is the facility with which nature rids itself of the prevalent collections which are sometimes so numerous in all the lobes of the liver.

There is another part of our studies which I would like to present to the Academy—that is, the formation proper of the pus. But here we arrive at results so contrary to those admitted in scientific circles, and it is so difficult to come to a conclusion in these very delicate researches, that I may postpone this demonstration to another time. For us, actually, the red corpuscles of

the blood are the ones which form the pus corpuscles, by a pure and simple transformation of the former into the latter. But in sciences *of observation*, so-called, the illusion is so easy, that one remains satisfied with the observation.

There remains one point which deserves the attention of the surgeon: this is the effects of our microbe, generator of pus, when associated with the septic vibrio. Nothing easier than to suppose, so to say, two distinct diseases and to produce what might be called a *septicæmic purulent infection* or a *purulent septicæmia.* While the microbe generator of pus forms, when alone, a white, thick pus, slightly yellow or blueish, odorless, diffused or surrounded with what is called a *pyogenic membrane*, and without danger if specially localized under the cellular tissue, ready, we might say, to be promptly resorbed; the smallest abscess, on the contrary, that is produced by this microbe associated with the septic vibrio, assumes a gangrenous, putrid and greenish aspect, and seems infiltrated in the softened tissues. In this case the microbe generator of the pus, mixed up with the septic vibrio, penetrates with it in all the tissues; even the muscles become inflamed, full of serosity, showing sometimes pus corpuscles here and there, and seemed to be filled with two different organisms.

By an analogous method the effects of the carbuncular bacteridie and of the microbe can be combined, and thus two different maladies be superposed, viz: a purulent anthrax or a carbuncular purulent infection. However, one must not exaggerate the predominancy of the actions of the new microbe over that of the bacteridie; if the microbe is mixed to the bacteridie in sufficient proportion, it may destroy it entirely—that is, prevents its multiplication in the body. Anthrax then does not appear, and the trouble, remaining all local, is only an abscess of easy cure. The microbe generator of pus and the septic vibrio being both anærobic, we understand how one—the septic—would be interfered by the other. Nutritive elements, solid or liquid, are always plenty in the organism for so small beings; but the carbuncular bacteridie is exclusively ærobic, and the proportion of oxygen in every point of the body is limited

to some extent; at least many circumstances may diminish it or remove it entirely, here and there, and as the microbe is also an ærobic being, it being in greater number, it will take off a large amount of the oxygen necessary to the development and life of the bacteridie. No matter, however, what the explanation of the fact may be, it is certain that the microbe referred to in this paper prevents, in some circumstances, the development of the bacteridie. Last year we met with one fact entirely like the above.

To resume, one sees from the preceding details that one may produce at will purulent infections free from any putrid element, putrid purulent infections, carbuncular purulent infections, various combinations, different sorts of lesions according to the proportion of the specific microbes introduced in the organism.

Such are the principal facts that I wished to present to the Academy in my name and those of my assistants. This lecture is the demonstration of a series of propositions which I presented to you some time ago.

Some weeks past, one of the members of the section of medicine and surgery—Mr. Seidllot—after long thought, stated that he had no hesitancy in saying that the success, as well as the failures, in surgery would find a rational explanation in the principles upon which the *germs theory* rests, and that this would give birth to a new surgery, already inaugurated by a famous English surgeon—Doctor Lister—who, one of the first, appreciated its fruit. Without professional competency in the subject, but with the conviction of the satisfied and authorized experimenter, I would dare here to repeat the very words of our illustrious confrere.

EXTRACTS FROM FOREIGN JOURNALS.

By A. Liautard, M.D., V.S.

Rupture of the Uterus before delivery—General putrid emphysema of the Fœtus.

Cow, eight years old, which for several days is ailing, appetite somewhat diminished, the forerunning symptoms of delivery are well marked, at times slight colics and efforts at expulsion.

The causes of this condition are unknown, time of gestation is supposed to be passed for several days.

General condition.—Prostration, anorexia, diarrhœa, artery soft and small, pulse quick and weak, respiration quiet, thick, abundant and yellow greenish mucous through the vulva, neck of uterus is close, a fœtus well developed and immobile is felt through the walls of the rectum.

The next day, general condition more satisfactory, no diarrhœa, appetite better, three fingers can be introduced into the os uteri.

Diagnosis.—Probable death of the fœtus; prognosis, cautious.

Treatment.—Abortive drench of oz. ii of ergot; without result. The next day, increase in the symptoms, animal is lying down, very tympantic, respiration increased, pulse very quick and feeble, entire loss of appetite. The os uteri is sufficiently open to allow the introduction of the hand, which then brings out some thick, offensive mucosities. The patient is very weak and dies during the manipulations for the extraction of the fœtus.

Autopsy.—Large effusions in the abdomen of a thick, bloody fluid of an infect odor, with blackish clots of various forms, size, and consistency; a great part of the fœtus is out of its natural cavity and rests on the rumen and intestines; the fœtal envelopes are torn and in a putrid condition; the displacement has taken place through a wide solution of continuity between the uterine horns and extending over the superior and inferior face of the organ; another smaller opening is found also at the junction of the lateral and superior face of the left horn. These wounds have irregular edges, somewhat smooth and infiltrated with blood. In the largest laceration, the two layers, muscular and mucous, have an uneven size; the former being retracted, the mucous forms alone the free border of the opening. The fœtus was enormously developed by the infiltration of both liquid and gas through the cellular tissues.

The general emphysema of the fœtus is one of the causes of dystocia which had been heretofore unnoticed.

—*Annales de Bruxelles, April.*

CÆSARIAN OPERATION IN THE SLUT.

In the "Annales de Bruxelles," Professor Degive remarking how few cases of *abdominal hysterotomy* are on record, reports three cases where he performed it with success.

The first was a slut at term, which had been in pain for twelve hours. Vaginal exploration revealed the presence of a fœtus at the dilated os uteri, but unable to pass on account of the narrow pelvic passage. The operation performed, four pups were removed. The mother and two of the little ones lived.

In the second, a water spaniel slut, small size, was in pain for twenty-four hours. She had delivered with difficulty, a dead fœtus; another was engaged in the uterine opening. In trying to extricate it, the head, with the two anterior legs, were pulled off. Unable to reach the remaining, hysterotomy was performed and the trunk and hind legs of the fœtus were removed. Weak for several days after the operation, she made a perfect recovery.

The third was a slut bought for experiment on castration. When ready to be operated, the horns of the uterus were found to contain each two embrios of the size of a large nut. The four fœtus were removed by incision of the uterine horns, and ten days after the slut had entirely recovered.

PROLAPSUS RECTI IN THE DOG—NEW MODE OF REDUCTION—INDICATION AND VALUE OF GASTROTOMY.

Danish dog, small size, presenting the symptoms of a *prolapsus with invagination* of the rectum. The reduction was difficult but secured with a cross suture. Towards the third day this being removed, the difficulty reappeared. Second reduction, second suture, second failure. The organ being then carefully pushed back with a smooth wood speculum, a third reduction was made with another more secured suture. A third failure was the result. It was then decided to open the flank and act directly upon the organ itself. The abdomen was opened, the rectum pulled back to its place and the anus closed by the same suture used in the third attempt. The dog got well and remained so for fifteen days, when the difficulty returned. Many other means were also put in

practice, but all failed, and death ultimately took place after two months of treatment.

In conclusion the author points out the immunity of gastrotomy, mentions cases where in cattle, and even horses, the abdominal cavity has been open for the reduction of invagination of parts of intestines or the removal of calculi, etc., and asks if the operation is by itself as serious as generally considered, and if it would find a justifiable indication in certain cases such as foreign bodies, lesions of connection and distocia.—*Annales de Belgique, August.*

HYDROPHOBIA IN A BROOD MARE.

A mare, eight years old, with sucking colt of two months is one day taken sick, worries and seems to have violent colics, which soon pass away. The following evening she presents the same symptoms, but more marked. When examined by the veterinarian, she seemed very excited, turned continually in her stall, does not attempt to bite or kick; her eyes are very bright, and look as amaurotic; she obeys the voice of her owner and allows her colt to take the breast without noticing him; she refuses all food. Ordinarily of a quiet disposition and lymphatic, she is very excitable. She energetically rubs herself right and left on the withers and ribs, which are already swollen and much bruised.

This lasted several hours and was followed by a state of quietude. The colt was taken away, and the mare kept by herself.

The next morning she was paralyzed, and died several hours later.

On inquiry, it was found that eight months previous she had been bitten by a mad dog.

The points of interest are the incubation of the disease, the fact that the mare was nursing her colt over two months when the disease showed itself, and that this colt is in perfect health, and has never shown any bad effect from the milk she took from her dam.—*Journal de Zootechnie, Lyons.*

REPORTS OF CASES.

COMPLICATION IN SEVERE LARYNGITIS,

Viz.: Escaping of Fluids (water or gruel) through an Abcess in the Inter-Maxillary Space while in the act of Deglutition.

BY G. P. PENNIMAN, D.V.S.

The patient, a grey mare six years of age, came for treatment April 22d, showing considerable difficulty in breathing and inability to eat or drink; swellings in the inter-maxillary region, and some local irritation of the skin under the fetlocks. Later, the skin sloughed from these parts, leaving unhealthy-looking surfaces.

The usual treatment for laryngitis was pursued, but upon the 25th, respiration was so labored that tracheotomy was performed.

27th. Inferior cervical and a portion of the pectoral regions were much swollen and hard, but the breathing was easy through the tube.

28th. Dark or chocolate-colored pus had worked from an abcess in the inter-maxillary space beneath the skin down to the point where the tube was inserted, and there escaped. The abcess was then opened.

29th. The animal succeeded in swallowing a little water and soon after coughed from the mouth a tea cup-full of pus.

30th. Some improvement, but in *drinking gruel or water* (which she did more readily) a portion of it *would escape* from the abcess in the inter-maxillary space and from beneath the skin at the point of insertion of the tracheotomy tube.

She continued to improve. The extensive swellings diminished faster than was expected; only a stimulating lotion, with palma friction, being used for them.

May 2d. The tube was removed and the wound appeared healthy. Those of the fetlocks were better, but were quite tardy in healing. No further escape of fluids was noticed.

She improved rapidly from this time, and upon the 20th was turned to pasture and has entirely recovered.

COMPARATIVE SURGERY—PROLAPSUS RECTI IN A MONKEY—AMPUTATION.

By A. H. Rose, D.V.S., House Surgeon.

On July the 4th, there was brought to the hospital of the Veterinary College a male monkey about three years old and of good health, with the following history:

He had eaten a large amount of cherries (with the pits) which had given rise to much uneasiness, straining and tenesmus; the rectum was pushed externally, with inability to return to the pelvic cavity.

Symptoms.—Animal suffering much pain; rectum protruding about two and a-half inches and dark in color, very offensive, in fact, in a state of gangrene; loss of appetite; animal much dejected and wanting to lie down all the time.

Diagnosis.—In consequence of the condition of the patient a diagnosis was made easily, with an unfavorable prognosis, on account of the extent of the lesion and of the delicate nature of the little patient.

Treatment—The portruding portion of the intestine was grasped in the ecraseur and about two and a-half inches was excised, with no hemorrhage, and dressed with carbolic solution; buckthorn syrup ℥i was also administered, with directions to feed on food of a laxative nature.

5th inst. Animal lying down most all the time, and seems very much dejected; will not eat voluntarily, so had to be fed on milk, Oj during the day.

6th inst. Animal a little brighter; will eat only by compulsion, in which manner he received during the day of milk Oiss; not much change in the fæces as to purgative action.

7th inst. Buckthorn acting as a purgative; animal eating a little milk of his own accord; does not want to lie down so much.

8th inst. Animal eating better, and he seems much brighter in every manner; still purging very nicely, and no pain in passing his stools.

9th inst. Still purging nicely; animal much brighter and more lively; eating of his own accord from Oj to Ois of milk a day.

10th inst. Purging stopping; eating anything you will give him; improving in every manner.

12th inst. Still improving; so much as to be able to go home at any time.

13th inst. Discharged free from all trouble, with orders to feed on laxative food for a week or ten days to come, so as not to irritate the rectum.

Aug. 20th. Is reported as mischievous as ever, and none the worse for the loss of its rectum.

CALCAREOUS GROWTHS ON THE CHOROID PLEXUSES—ENCEPHALITIS—DEATH.

By R. A. McLean, Student.

The subject of the following report was a bay gelding, nine years old, the property of Mr. Jacob Sapp, who had bought him on the 8th of August, to be used to a business wagon. On the 9th, at 3:30 A. M., Dr. Coates was called, and on arriving at the stable found the horse lying down, and got the following history:

The horse was bought the day before, and driven, going, the owner said, all right, and on being put into the stable was fed, showing no signs of sickness. At 3 A. M. the owner was awakened by hearing the horse kicking, and on visiting him and finding him down and unable to rise, called the doctor, who, on arriving, endeavored to get him up; but although he would rise a little he would fall back again, as if paralyzed behind, always falling on his left side. The pulse was full and soft, about 44; respiration 12 and temperature 101½. On pricking him along the back and legs he showed sensation, and at last got up. On introducing a cateter, about six pints of urine were withdrawn, normal in appearance, and acid. In endeavoring to back him out of the stall he kept his fore legs stretched as in laminitis, his hind legs moving feebly; but after considerable effort he was got out and walked a little, with a swaying motion, but with perfect freedom of the extremities. He was offered some grass, which he took, chewing it a little and retaining it in his mouth. He rested his lips on the manger and looked very drowsy.

The diagnosis of encephalitis with a doubtful prognosis was made. He was ordered to be sent to the hospital, where he was admitted at 11 A. M. In walking the distance from his stable to here (four blocks), he swaggered very much from side to side, lifting his fore feet high. He was placed in a box stall and bled till seven quarts were obtained. Pulse then 63 and small; respiration normal. ʒ vii of aloes were administered and he received a rectal injection, a little hard fæces being taken away, this to be repeated three times a day, and a cold water douché ordered to be applied to his head, which after four hours was replaced by the application of ice to the pole and head.

At 6 P. M. animal still drowsy and restless; pulse 39, full and soft; respiration 13; temperature 101. A small quantity of very hard fæces has been passed. He has taken no food, except a little sloppy bran mash. August 10th, 7 A. M., pulse 46, soft and full; respiration 30; temperature 102. Animal still very drowsy, but not quite so restless; legs ordered to be bandaged and the rectile injections and application of ice to be continued, the patient to be fed on low diet. At 12 noon gave ℥ vi of sulphate of soda. At 3 P. M. a small quantity of soft fæces were passed, but animal not yet purging. At 6 P. M. pulse 36, full; respiration 15; temperature 103. Bowels are now working and injections ordered to be discontinued. August 11th, 7 A. M., pulse 48, soft and full, but stronger; respirations 24; temperature 103¼. Patient not so drowsy to-day, nor so restless, and now purging freely; blister of oil of cantharides ordered to back of head and neck, the ice still to be applied over the cranium. At 6 P. M. pulse 63, still full; respiration 37; temperature 103¼. Has no appetite, but appears decidedly brighter.

August 12th, 7 A. M., pulse 72, full but weaker; respiration 29; temperature 103 1-5. Patient does not look so well this morning, and purging freely. Blistered surface ordered to be washed off and a fresh one applied of ung. cantharidi, the legs to be rebandaged and the patient to receive rice water in the shape of gruel, and to be allowed to lie down. At 6 P. M. pulse 76; respiration 31; temperature 103¼.

August 13th, 7 A. M., pulse 80; respiration 36; temperature $102\frac{3}{4}$. The purging still continues, to which is attributed the high and weakened condition of the pulse. Patient is dull and heavy, and more restless; ordered to receive rice water injections, combining with them opium. 6 P. M., pulse 82; respiration 38; temperature 103 2-5. Has taken a little hay and rice water to-day.

August 14th, 7 A. M., pulse 92; respiration 42; temperature 104. To-day the pulse is weaker and animal ordered to be placed under stimulants, is a little purging, though much checked. He got pul. opii. ʒiv., pul. catechu ʒi., carb. ammon. ʒii., and also stimulant baths three times a day. The application of ice and rice water injections are continued. During the day he was very restless, refusing to eat; and at 6 P. M. the pulse was 96; respiration 56; temperature 107. He continually walked around his box stall, pushing his head violently against the sides, and exhibiting stronger brain symptoms than at any time since admission. At 8:30 P. M. he lay down, and shortly after commenced struggling violently, dying in delirium about 9:15 P. M.

Post mortem made eighteen hours after death. On disarticulating at the occipite axoid articulation, a quantity of effusion escaped. On removing the brain, the entire external surface was found to be much congested, especially the left hemisphere; this appearance extending over the medulla oblongata. At the base of the right hemisphere, over the seat of the mastoid lobe, there is a sub-arachnoid infiltration. On cutting into the ventricles they are found to be filled with serosity, ʒ iii. being taken from the central ventricle of the left side. The corpora striata and the pituitary gland are of their natural size, and appear normal. Internally, the brain substance of both the cerebrum and cerebellum appears normal, but the choroid plexes of both are the seat of extensive calcareous deposits. From each lateral ventricle were removed large tumors, oval in form, dark colored and granular to the touch, that from the left side being the largest, and weighing one ounce. It was strongly attached to the coat that forms the choroid plexus and one horizontal section was found to consist of

a mass of calcareous substance, imbedded in meshes of loose cellular tissue. Upon its external surface, at one point, a large cyst was found filled with serosity. The smaller tumor, taken from the right ventricle, weighed one drachm, and had the same appearance as the other.

The fluid contained in the ventricles was limpid and slightly yellowish, alkaline in reaction, slightly albuminous, and on cooling after being heated, a considerable coagulation was observed. The other organs were not examined.

This is a beautiful illustration of the post mortem lesion found in cases of *immobility*, and though the history of the case fails to show that the animal exhibited any of the symptoms of that disease, there is no doubt that he must have been affected with it previous to the time of purchase, and consequently was an unsound horse. Should an action be brought by the buyer, it is certain that the dealer would be condemned to suffer the loss of the animal, and to return the purchaser the price he had received for it.—*Editor*.

NOTICE.

MEETING OF THE UNITED STATES VETERINARY MEDICAL ASSOCIATION.

The next annual meeting of the United States Veterinary Medical Association, will be held at the American Veterinary College, No. 141 West Fifty-fourth street, New York City, on Tuesday, September 17, 1878. All members are respectively invited to attend.

By Order,

A. A. Holcombe, D.V.S.,

Secretary.